

INTEGRATING NATURAL CAPITAL INTO DEVELOPMENT PLANNING IN UGANDA: INSIGHTS FROM THE ECOSYSTEM SERVICES AND ASSET ACCOUNTS (1990-2015)

POLICY BRIEF BY



CENTRE OF EXCELLENCE FOR AFRICA CLIMATE-SENSITIVE
MACROECONOMIC MODELLING (CEACM)



Key Messages

- Ecosystem services are vital yet undervalued. Uganda's ecosystems provide food, water, carbon storage, climate regulation, biodiversity, and tourism benefits, but these contributions remain largely invisible in conventional economic planning and national accounts such as GDP.
- Natural capital is under growing pressure. Rising demand for land, food, water, and biomass energy, driven by rapid population growth and agricultural expansion, is pushing ecosystems toward their ecological limits.
- High-value ecosystems are degrading. Forests and wetlands, which deliver the greatest ecological and economic benefits, have suffered losses due to deforestation, wetland encroachment, and unsustainable resource use.
- Restoration and sustainable management are essential. Scaling up ecosystem restoration, promoting sustainable agriculture, expanding alternative energy, and strengthening legal protection are critical to safeguard ecosystem service flows and build climate resilience.

- Integrating ecosystem accounting into policy is urgent. Embedding ecosystem accounts into national planning and budgeting will support NDP IV objectives, align with ATMS sectors, and ensure long-term sustainability, with tourism highlighted as a priority sector given its high return on investment.

1. Background and Motivation

Uganda is widely recognized for its rich biodiversity and diverse ecosystems, which include tropical forests, wetlands, lakes, grasslands, and mountainous landscapes. These ecosystems provide critical ecosystem services that sustain livelihoods, support economic activity, and maintain ecological stability. These ecosystem services are generally categorized into three main types:

- Provisioning services, which provide direct material benefits such as food, timber, fuelwood, fish, and freshwater.
- Regulating services, which help regulate environmental processes, including climate regulation, water purification, erosion control, and flood mitigation.
- Cultural services, which provide recreational, spiritual, and tourism benefits derived from natural landscapes.

These services are particularly important in Uganda, where a large proportion of the population depends directly on natural resources for agriculture, energy, and income generation (Babyenda et al. 2024). Unfortunately, Uganda has experienced significant environmental degradation over recent decades. One of the most striking changes has been the rapid decline in natural forest cover. Historically, forests covered approximately 54% of Uganda's land area, but by 2015 this had fallen to about 8%, largely due to agricultural expansion, charcoal production, and illegal logging (MWE, 2015). Wetlands, another vital ecosystem, are also under pressure due to urban expansion, industrial development, and agricultural encroachment. Pollution from agriculture, mining, and urban wastewater has increasingly affected rivers and lakes, threatening water quality and biodiversity. These environmental pressures are closely linked to rapid population growth. Uganda's population increased from 17 million in 1991 to 35 million by 2014, and it continues to grow at one of the fastest rates globally (UBOS, 2015). This demographic expansion has significantly increased demand for land, water, energy, and food.

In this context, ecosystem accounting provides a

powerful analytical tool to help policymakers understand how ecosystems contribute to the national economy and how environmental degradation affects long-term development. By systematically measuring ecosystem service flows and asset values, ecosystem accounts help ensure that natural capital is recognized alongside produced and human capital in national planning processes (United Nations et al., 2021).

To properly understand the constraints and challenges in managing this critical ecosystem, Uganda commissioned a monetary services value account in 2023. It is from these accounts that this policy brief has been prepared to inform fiscal, financial and monetary policies.

2. Methods and Scope

The brief summarizes the ecosystem extent and condition, flows of ecosystem services (both physical and monetary), from open water, wetland, grassland, bushland, woodland, natural forest, plantation forest, farmland and the built-up and bare areas extracted from the land cover data for the period 1990 to 2015 as published by UBOS in its Ecosystem Accounts report of 2023.

The monetary valuation of ecosystem services was conducted using the exchange value concept, which reflects the value that these services would have in a market context. Two primary valuation approaches were applied. The resource rent approach was used for provisioning and cultural services, estimating the residual value of ecosystem services after subtracting the costs of human inputs, such as labor and capital, from the total value of production. The avoided cost approach was applied to regulating services, estimating the costs that society would incur if these services were lost and had to be replaced with artificial infrastructure or technological solutions. Ecosystem assets represent the long-term capacity of ecosystems to generate future services. Their value was calculated using the net present value

(NPV) of expected ecosystem service flows over a 100-year time horizon. A social discount rate of 4.04% was used to convert future ecosystem service values into present values, consistent with approaches used in environmental economic analysis (Nordhaus, 2017). All monetary values were expressed in constant 2017 Ugandan Shillings (UGX) to remove the effects of inflation. Spatial analysis was conducted using a 100-meter by 100-meter grid, allowing ecosystem service values to be mapped and aggregated at national, basin, and district levels.

3. Classification of Ecosystem Services

Uganda's ecosystem accounts classify land cover into ten major ecosystem types based on national land cover datasets and ecological mapping. The types include; Open water, Wetlands, Grasslands, Bushlands, Woodlands, Natural forests, Plantation forests, Farmland, Built-up areas and Bare land. These classifications were derived from spatial data produced by the National Forestry Authority (NFA) and regional vegetation maps developed by van Breugel et al. (2015). The classification framework allows for detailed analysis of ecosystem service supply across different landscapes and enables comparisons across administrative regions. The ecosystem services include:

(i) Provisioning Services

Provisioning services include resources that ecosystems directly provide for human use. In Uganda's accounts, these encompass crop production, grazed biomass for livestock, wood and timber resources, wild fish, other wild natural products, and freshwater supply. These services form the foundation of Uganda's rural economy and are particularly important for subsistence agriculture and energy supply.

(ii) Regulating Services

Regulating services reflect ecological processes that maintain environmental balance and reduce environmental risks. The accounts measure several key regulations, including carbon retention and storage, sediment retention for erosion control, nutrient retention and water purification, and water flow regulation. These services help stabilize climate systems, maintain water quality, and prevent land degradation.

(iii) Cultural Services

Cultural services include recreational and tourism activities supported by natural ecosystems, particularly wildlife and protected landscapes such as national parks and forest reserves.

Tourism based on wildlife and natural landscapes is one of Uganda's fastest growing economic sectors and represents an important source of foreign exchange.

4. Findings and discussion

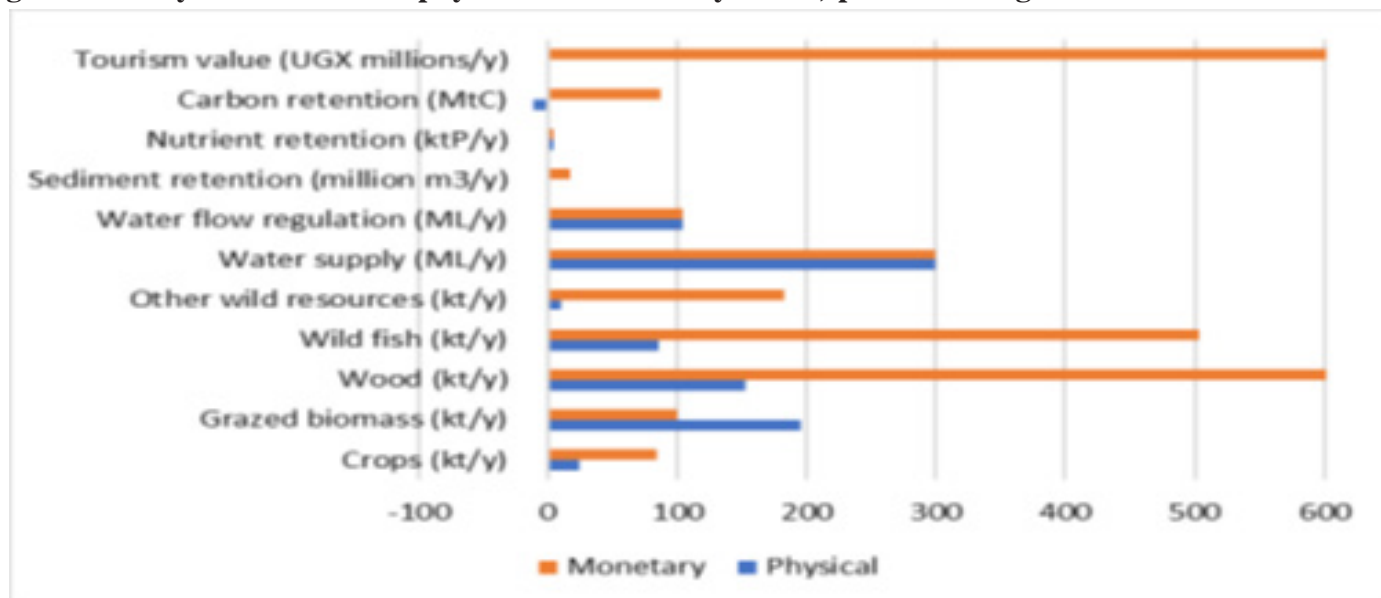
The demand for provisioning ecosystem services in Uganda increased substantially between 1990 and 2015. During this period, crop production rose by 25%, grazed biomass increased by 195%, wood harvesting grew by 153%, and water supply expanded by 300%. These increases largely reflect rapid population growth, the expansion of agricultural production, and a greater reliance on biomass energy.

a) Rapid Growth in Tourism Value

Tourism-related ecosystem services experienced the most dramatic growth. The value of ecosystem contributions to tourism increased by over 6000% between 1990 and 2015 (Fig1). This growth reflects both rising international tourism demand and government investments in national parks, wildlife conservation, and tourism infrastructure.

Uganda's protected areas, including wildlife reserves, national parks, and forest reserves, play a crucial role in supporting tourism-related ecosystem services.

Figure 1. Ecosystem services in physical and monetary terms, percent change from 1990 to 2015.

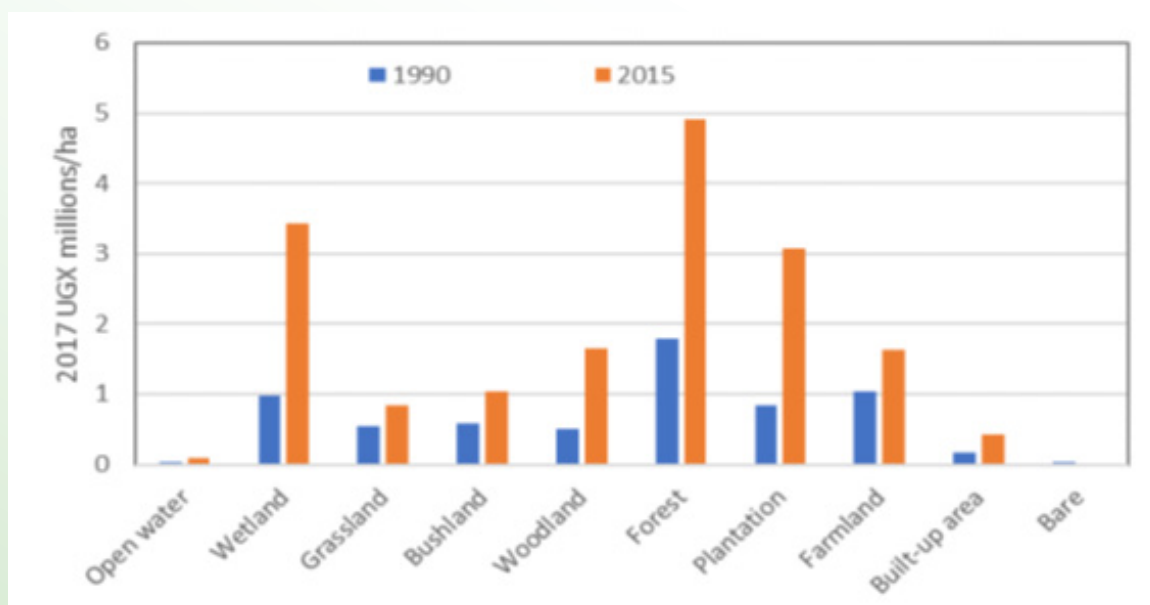


Source: Extracted from UBOS's Ecosystem Services & Asset Accounts Brief (2023)

b) Rising Monetary Value of Ecosystem Services

The total value of ecosystem services increased from UGX 16.8 trillion in 1990 to UGX 32.1 trillion in 2015, representing a 91% increase. However, ecosystem services contributed a smaller proportion of national GDP over time. Their contribution declined from 66% of GDP in 1990 to 31% in 2015, suggesting that economic growth has become less dependent on ecosystem services relative to other sectors.

Figure 2. Average monetary value of ecosystem service flows per ecosystem type per ha per year in 1990 and 2015, Values expressed in constant 2017 UGX million per ha per year.



Source: Extracted from UBOS's Ecosystem Services & Asset Accounts Brief (2023)

c) High Value of Forest and Wetland Ecosystems

Forests and wetlands provide some of the highest ecosystem service values per hectare due to their multifunctional ecological roles. Forests contribute significantly through carbon storage, biodiversity conservation, soil protection, and tourism services. Wetlands play a critical role in water purification, flood control, and nutrient retention. Despite their high economic value, both ecosystem types have experienced significant degradation in recent decades.

d) Declining Natural Capital per Person

While total ecosystem asset value increased from UGX 387.6 trillion in 1990 to UGX 682.9 trillion in 2015, the value per capita declined by 17.7%. The decline indicates that the ecological resources available to support each Ugandan citizen are decreasing. Significant asset losses occurred due to reductions in; Natural forests, Woodlands, Wetlands and Open water ecosystems. If these trends continue, the capacity of ecosystems to sustain economic development may be compromised.

5. Conclusions and Policy Implications

The findings reveal that Uganda's ecosystems are facing mounting pressure from rising demand for land, food, water, and biomass energy. Without effective management, these pressures risk pushing ecosystems beyond their ecological limits.

Natural capital remains largely invisible within traditional economic decision making frameworks. Consequently, environmental degradation is often overlooked in the evaluation of development projects. Restoration and conservation efforts are

therefore essential to sustain ecosystem service flows and to prevent further declines in natural capital.

Finally, population growth and land use change will continue to intensify pressure on natural resources unless more sustainable production systems are adopted.

To address some of the challenges affecting Uganda's eco-system, the brief recommends the following:

(i) Integrate ecosystem accounting into national planning and budgeting processes. This will strengthen the management of natural capital, thereby supporting the achievement of NDP IV objectives and advancing the Ten Fold Growth Strategy. This approach is cross cutting and closely aligned with the ATMS sectors - Agro industrialization, Tourism, Minerals, Science, Technology, ICT, and the Creative Industries. Given its high return on investment, tourism should be prioritized as a key sector for Uganda's sustainable growth.

(ii) Strengthening protection of high-value ecosystems. Forests and wetlands should be accorded with stronger legal protection, with enforcement mechanisms enhanced to prevent further degradation. At the same time, community based management practices that highlight the value of these ecosystems to local populations should be actively promoted and supported.

(iii) Scale up ecosystem restoration programs across the country. Ecosystem restoration initiatives should be expanded and strengthened to accelerate the recovery of degraded forests, wetlands, and landscapes. Scaling up these programs will help restore vital ecosystem service flows, enhance biodiversity, and build greater resilience to climate change.

(iv) Promote sustainable agricultural intensification. Enhancing productivity on existing farmland will reduce pressure to convert additional natural ecosystems, thereby safeguarding biodiversity and ecosystem services. Improving productivity on existing farmland can reduce pressure to convert additional natural ecosystems.

(v) Expand access to alternative energy sources. Expanding access to affordable and reliable alternative energy sources is essential for reducing dependence on fuelwood and charcoal. Transitioning households and communities toward cleaner options such as liquefied petroleum gas (LPG), solar energy, and biogas will ease pressure on forest ecosystems while improving public health and energy security.

(vi) Invest in education and family planning programs. Strengthening education and family planning initiatives is critical to addressing rapid population growth. Expanding access to quality education, particularly for girls and young women, alongside comprehensive family planning services, will help reduce long term pressure on natural resources. These investments not only promote sustainable population dynamics but also enhance human capital, improve livelihoods,

and support Uganda's broader development and climate resilience plans.

(vii) **Future Directions for Ecosystem Accounting in Uganda.** Further development of Uganda's ecosystem accounts should incorporate additional services not covered in the current assessment, including pollination, flood regulation, air quality regulation, and urban climate regulation. Updating the accounts with the 2021 high resolution national land cover dataset will improve spatial accuracy and enable more detailed analysis at regional and district levels. Future work should also integrate ecosystem condition indicators to measure ecosystem health and resilience. This will strengthen the ability to assess long term sustainability of ecosystem service flows and provide a more comprehensive evidence base for policy and planning.

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